WE CLAIM:

1. A digital image sensor, comprising:

a two-color photo-detector having a first photo-detector element capable of absorbing light within a first range of wavelengths and a second photo-detector element capable of absorbing light within a second range of wavelengths, said first photo-detector element being in an elevated relation with said second photo-detector element, said first photo-detector element being electrically isolated from said second photo-detector element.

2. The sensor of Claim 1, further comprising:

a substrate, said second photo-detector element being formed within said substrate.

3. The sensor of Claim 2, further comprising:

a dielectric layer between said first photo-detector element and said second photo-detector element, said dielectric layer electrically isolating said first photo-detector element from said second photo-detector element.

4. The sensor of Claim 1, wherein said first photo-detector element is formed of amorphous silicon having a thickness selected to absorb light within said first range of wavelengths and pass light within said second range of wavelengths, said second photo-detector detecting light within said second range of wavelengths passed by said first photo-detector element.

5. The sensor of Claim 1, wherein said first and second photo-detector elements are photodiodes.

6. The sensor of Claim 5, wherein said photodiodes are PIN photodiodes.

7. The sensor of Claim 1, further comprising:

a color filter in an elevated relation with said first photo-detector element, said color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths.

8. The sensor of Claim 7, further comprising:

a transparent metal conductor layer between said color filter and said first photo-detector element.

9. The sensor of Claim 1, further comprising:

circuitry for driving said first photo-detector element and said second photo-detector element, said first photo-detector element being in an elevated relation with said circuitry.

10. The sensor of Claim 1, further comprising:

a second two-color photo-detector having a third photo-detector element in an elevated relation with a fourth photo-detector element, said third photo-detector element being electrically isolated from said fourth photo-detector element.

11. The sensor of Claim 10, wherein said two-color photo-detector further comprises a first color filter in an elevated relation with said first photo-detector element of said first two-color photo-detector, said first color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths, said second two-color photo-detector further comprising a second color filter in an elevated relation with said third photo-detector element of said second two-color filter, said second color filter absorbing light within either said first or second ranges of wavelengths, passing light within said third range of wavelengths and passing light within either said first or second ranges of wavelengths not absorbed by said second color filter.

12. The sensor of Claim 10, wherein said third photo-detector element is capable of accumulating charge upon reception of light within a third range of wavelengths and said fourth photo-detector element is capable of accumulating charge upon reception of light within a fourth range of wavelengths.

13. The sensor of Claim 12, wherein said first photo-detector element produces a first color value, said second photo-detector element produces a second color value, said third photo-detector element produces a third color value and said fourth photo-detector element produces a fourth color value, and further comprising:

a third two-color photo-detector having a fifth photo-detector element in an elevated relation with a sixth photo-detector element, said fifth photo-detector element being electrically isolated from said sixth photo-detector element, said fifth photo-detector element being capable of absorbing light within said first range of wavelengths and producing a fifth color value, said sixth photo-detector element being capable of absorbing light within said second range of wavelengths and producing a sixth color value; and

a fourth two-color photo-detector having a seventh photo-detector element in an elevated relation with an eighth photo-detector element, said seventh photo-detector element being electrically isolated from said eighth photo-detector element, said seventh photo-detector element being capable of absorbing light within said first range of wavelengths and producing a seventh color value, said eighth photo-detector element being capable of absorbing light within said second range of wavelengths and producing an eighth color value.

14. A digital image sensor, comprising:

a two-color photo-detector having a first photo-detector element capable of absorbing light within a first range of wavelengths and a second photo-detector element capable of absorbing light within a second range of wavelengths, said first photo-detector element being in an elevated relation with said second photo-detector element; and

a dielectric layer between said first photo-detector element and said second photo-detector element.

15. The sensor of Claim 14, further comprising:

a substrate, said second photo-detector element being formed within said substrate.

16. The sensor of Claim 14, wherein said first photo-detector element is formed of amorphous silicon having a thickness selected to absorb light within said first range of wavelengths and pass light within said second range of wavelengths, said second photo-detector detecting light within said second range of wavelengths passed by said first photo-detector element.

17. The sensor of Claim 14, further comprising:

a color filter in an elevated relation with said first photo-detector element, said color filter absorbing light within a third range of wavelengths and passing light within said first and second ranges of wavelengths.

18. The sensor of Claim 17, further comprising:

a transparent metal conductor layer between said color filter and said first photo-detector element.

19. The sensor of Claim 14, further comprising:

circuitry for driving said first photo-detector element and said second photo-detector element, said first photo-detector element being in an elevated relation with said circuitry.

20. A method for demosaicing an array of two-color photo-detectors, comprising:

producing eight color values from a block of four two-color photo-detectors within said array of two-color photo-detectors, each of said two-color photo-detectors within said block of four two-color photo-detectors having an upper photo-detector element in an elevated relation with and electrically isolated from a lower photo-detector element, a first pair of two-color photo-detectors within said block of four two-color photo-detectors producing two of said eight color values that are associated with light received within a first range of wavelength and two of said eight color values that are associated with light received within a second range of wavelength, a second pair of two-color photo-detectors within said block of four two-color photo-detectors producing two of said eight color values that are associated with light received within a third range of wavelength and two of said eight color values that are associated with light received within a fourth range of wavelength, said eight color values being of a first color space;

determining a color transformation matrix for converting said first color space into a second color space, said second color space including a luminance color plane, a first chrominance color plane and a second chrominance color plane; and

applying said eight color values to said color transformation matrix to convert said eight color values into four luminance values within said luminance color plane, one first chrominance value within said first chrominance color plane and one second chrominance color value within said second chrominance color plane.

21. The method of Claim 20, wherein said step of applying further comprises:

applying said eight color values to said color transformation matrix to obtain eight equations with six unknown values corresponding to said four luminance values, said one first chrominance value and said one second chrominance value; and

solving said eight equations using a least squares method to determine said six unknown values.

22. The method of Claim 21, wherein said step of determining further comprises:

determining a basic color transformation matrix for converting between said first color space and said second color space, said basic color transformation matrix converting color values from said first, second, third and fourth ranges of wavelength into one of said luminance values, said one first chrominance value and said one second chrominance value; and

expanding said basic color transformation matrix to said color transformation matrix capable of converting said eight color values into said four luminance values, said one first chrominance value and said one second chrominance color value.

23. A method for demosaicing a digital image obtained from an image sensor having photo-detector locations of two-color photo-detectors arranged in rows and columns, each of said two-color photo-detectors having an upper photo-detector element in an elevated relation with and electrically isolated from a lower photo-detector element, said image sensor producing color values that are associated with light within four different ranges of wavelength, said method comprising:

receiving a set of color values associated with light within said four different ranges of wavelength;

determining, for a select photo-detector location producing first and second color values within said set of color values that are associated with light within first and second ones of said four different ranges of wavelength, a horizontal gradient and a vertical gradient associated with a third one of said four different ranges of wavelength, using said set of color values, said horizontal and vertical gradients corresponding to the alignment of said rows and columns of said photo-detector locations; and

interpolating a missing third color value associated with light within said third range of wavelengths for said select photo-detector location using said horizontal and vertical gradients.

24. The method of Claim 23, wherein said step of interpolating further comprises:

multiplying said horizontal gradient by the average of color values within said set of color values that are associated with light within said third range of wavelength and that are associated with photo-detector locations vertically adjacent to said select photo-detector location; and

multiplying said vertical gradient by the average of color values within said set of color values that are associated with light within said third range of wavelength and that are associated with photo-detector locations horizontally adjacent to said select photo-detector location.

25. The method of Claim 23, further comprising:

determining, for said selected photo-detector location, a horizontal gradient and vertical gradient associated with a fourth one of said four different ranges of wavelength, using said set of color values, said horizontal and vertical gradients corresponding to the alignment of said rows and columns of said photo-detector locations; and

interpolating a missing fourth color value associated with light within said fourth range of wavelengths for said select photo-detector location using said horizontal and vertical gradients.

26. The method of Claim 25, wherein said first, second, third and fourth color values are associated with a first color plane, and further comprising:

determining a color transformation matrix for converting between said first color space and a second color space, said second color space including a luminance color plane, a first chrominance color plane and a second chrominance color plane; and

applying said first, second, third and fourth color values to said color transformation matrix to convert said first, second, third and fourth color values into a luminance value within said luminance color plane, a first chrominance value within said first chrominance color plane and a second chrominance color value within said second chrominance color plane.